

**Appendix F**  
**Selected Sections of the**  
**Del Amo Record of Decision**  
**(Sections 1 through 6)**

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# **I. DECLARATION**

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*Statutory Preference for Treatment  
as a Principal Element is Met  
and Five Year Reviews Are Required*

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## **1. Site Name and Location**

This Record of Decision (ROD) applies to *both* the Montrose Chemical Superfund Site and the Del Amo Superfund Site, in Los Angeles County, California. Portions of these sites lie within the City of Los Angeles, and adjacent to the City of Torrance, California.

## **2. Statement of Basis and Purpose**

This ROD presents the selected remedial action for (1) groundwater contamination, and (2) isolation and containment of non-aqueous phase liquids (NAPL) at the Montrose Chemical and Del Amo Superfund Sites. EPA has selected this remedy in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. §9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986, P.L. 99-499, 100 Stat. 1613 (1986) (CERCLA) and with the relevant provisions of the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300 (NCP). This decision is based on consideration of the administrative record, including public comments and the detailed analysis of the alternatives which are discussed and summarized in the Decision Summary.

This ROD establishes a *dual-site operable unit remedy*. This operable unit remedy is anticipated to be consistent with any other operable unit remedies, and the final remedies, for both the Montrose Chemical Superfund Site and the Del Amo Superfund Site. Such other remedies may apply to one or the other site individually, in contrast to the dual-site nature of this remedy.

This document identifies applicable or relevant and appropriate requirements (ARARs) and other criteria and requirements which shall be met in implementing this remedy. During investigations of the Montrose Chemical and Del Amo Superfund Sites, data has been collected in accordance with approved sampling and quality assurance management plans. EPA considers site data to be of adequate quality to support the remedy presented in this ROD. Remedial designs, actions, and operation and maintenance undertaken in the course of implementing this remedy shall comply with all standards, requirements and specifications in this ROD.

The State of California, acting by and through its Department of Toxic Substances Control, concurs with the remedy selected in this document.

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*Montrose Chemical and Del Amo Superfund Sites*

*March 1999*

The authority to select CERCLA remedial actions has been delegated to the U.S. EPA Region IX Superfund Division Director (*See* U.S. EPA CERCLA Delegations Manual, Delegation 14.5 (April 15, 1994) and redelegated by EPA Region IX Delegation Order, Selection of Remedial Actions (September 29, 1997)).

### **3. Assessment of the Site**

Releases of hazardous substances, pollutants or contaminants from the former DDT pesticide manufacturing plant operated by Montrose Chemical Corporation, including but not limited to chlorobenzene, DDT, and parachlorobenzene sulfonic acid, have resulted in hazardous substances contamination in the groundwater. Releases of hazardous substances from the former Del Amo Synthetic Rubber Manufacturing plant, including but not limited to benzene, ethylbenzene, and naphthalene have resulted in hazardous substances contamination in the groundwater. Releases of hazardous substances including but not limited to benzene, trichloroethylene (TCE), perchloroethylene (PCE), and dichloroethylene (DCE) have occurred potentially as a result of the operations at both the former Montrose Chemical and Del Amo plant properties and otherwise as a result of the operations of additional facilities in the immediately surrounding area. These releases have also resulted in groundwater contamination. Some of the hazardous substances discussed above are present below the ground surface in the form of non-aqueous phase liquids (NAPL) as well as dissolved in water and adsorbed to soils.

Contamination in groundwater from the two sites has partially commingled, or merged. Remedial actions selected for the contamination originating from either site individually would affect the contamination, execution, and implications of remedial actions selected for the contamination originating from the other site. The groundwater contamination from both sites is being addressed by EPA as a single technical problem with a unified remedial strategy which has been developed in part by considering the interrelationships of the various areas of groundwater at the Montrose Chemical and Del Amo Superfund Sites.

The groundwater contamination at and from the former Montrose and Del Amo plant properties; and the contamination from additional sources that is commingled, or within the area that might be subject to significant hydraulic influences from this remedy; are collectively referred to by EPA as "the Joint Site." This term is being used only with respect to this selected groundwater remedy. Additional description and caveats pertaining to the use of this term are provided in the Decision Summary of this ROD. Unless otherwise noted, where used in this ROD the term "both sites," shall refer to the Montrose Chemical Superfund Site and the Del Amo Superfund Site.

Actual or threatened releases of hazardous substances from both the Montrose Chemical Superfund Site and the Del Amo Superfund Site, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public

health, welfare, or the environment.

## **4. Description of the Remedy**

The implementation of the remedial actions selected by this ROD shall meet the description and all specifications and requirements as provided in this section, and the accompanying Decision Summary. The Decision Summary contains more detail on remedy description.

The primary principal threat at both of these sites related to groundwater is the NAPL which continues to dissolve into the groundwater. The dissolved contamination in the groundwater poses an unacceptable potential human health risk over the long term.. This selected remedial action is the first of two phases of remedial decisionmaking for the groundwater operable unit of the Montrose Chemical and Del Amo Superfund Sites. This ROD selects remedial actions that will:

- Contain the principal threat by containing the dissolved-phase groundwater contamination that surrounds the NAPL, thereby isolating the NAPL;
- Reduce the concentrations of dissolved contaminants in groundwater, outside the area of groundwater being contained, to levels that no longer pose an unacceptable health risk; and
- Prevent human exposure to groundwater contamination at these Superfund sites.

The containment of the principal threat shall be accomplished by (1) hydraulic extraction and treatment (with aquifer injection), and (2) reliance on intrinsic biodegradation, a form of natural attenuation. The manner in which each of these shall be applied is specified in the Decision Summary.

The reduction of concentrations of dissolved contaminants outside the area of groundwater being contained shall be accomplished by hydraulic extraction, treatment, and aquifer injection. This reduction shall occur at rates and meet time- and efficiency-based performance requirements specified in the Decision Summary. Some treated water may under this remedial action also may be discharged under permit to surface water channels. Provisions for institutional controls, monitoring, additional data acquisition, acceptable forms of groundwater treatment, and waivers of certain ARARs based on technical impracticability, shall also apply to this remedial action as specified in the Decision Summary.

EPA has determined that the remedial action selected in this ROD is protective of human health and the environment. However, the remedial action selected by this ROD does not remove

NAPL from the ground nor immobilize it. As extensively discussed in the Decision Summary, the remedial action selected by this ROD will remain in place over an extended time frame. The existing mass of NAPL and the potential for NAPL migration create significant uncertainties that the remedial action selected in this ROD will continue to remain protective of human health and the environment over the long term. To address such uncertainties, EPA will undertake a second phase of remedial decisionmaking for this groundwater operable unit, which will address whether and to what degree NAPL shall be recovered (removed) from the ground and/or immobilized at each of the two sites. Recovery and/or immobilization of the NAPL may enhance the long-term effectiveness of the remedial action selected in this ROD and may reduce these long-term uncertainties. If, as a result of such evaluations, EPA determines that additional remedial actions are required, EPA will select the second phase remedial actions in an *amendment* to this ROD. EPA may issue such an amendment, if any, as a stand-alone document or within the framework of another ROD for the Montrose and Del Amo site, including final site-wide ROD(s) which may be issued.

Performance of the second phase of remedial selection is authorized by and consistent with the NCP provision at 40 C.F.R. 300.430(f)(5)(iii)(D) which provides that the ROD may:

...When appropriate, provide a commitment for further analysis and selection of long-term response measures within an appropriate time frame.

This operable unit ROD finalizes the interim provisions of the operable unit ROD that EPA issued for the Del Amo Waste Pits on September 5, 1997, as specified and described in detail in the Decision Summary. These provisions were designed to control the Waste Pits as a source of continuing contamination to groundwater.

### **Remedial Actions**

Three areas of groundwater at the Joint Site are defined by convention in the Decision Summary of this ROD, as the *chlorobenzene plume*, the *benzene plume*, and the *TCE plume*. This ROD establishes differing remedial requirements and objectives for each of these plumes, within the context of the overall remedial action, as discussed in the Decision Summary. The Decision Summary provides numerous details and additional specifications related to each of the following elements which are incorporated in this Declaration by reference. In addition, the Decision summary includes specifications for the monitoring and evaluation of the performance of the remedial action, for the chemical pCBSA, for actions to be taken during the course of the remedial action, and other specifications.

The remedy shall consist of the following actions and meet the following requirements, as further discussed and developed later in this ROD:

- Dissolved phase contamination in a specifically-bounded, monitored zone of groundwater, as defined in the Decision Summary, shall be contained and isolated indefinitely such that the contamination cannot escape the zone. This zone is referred to by this ROD as the **containment zone**.<sup>1</sup> By containing the dissolved phase contamination surrounding the NAPL, this action isolates the NAPL from the remainder of groundwater.
- Specific ARARs shall be waived due to technical impracticability ("TI waiver"). The waived ARARs are identified in Appendix A of the ROD. The TI waiver of these ARARs shall apply solely to a zone of groundwater that is defined in the Decision Summary of this ROD and is referred to as the **TI waiver zone**. The TI waiver zone and the containment zone are congruent and refer to the same physical space.
- Contaminants within the containment zone shall be contained by two methods: (1) groundwater extraction and treatment, and (2) monitored intrinsic biodegradation. The method which shall apply shall differ for various portions of groundwater, as specified and in accordance with all requirements and provisions in the Decision Summary.
- The concentrations of dissolved phase contaminants in all groundwater at the Joint Site that lies *outside* the containment zone shall be reduced to concentrations at or below standards identified and discussed in the Decision Summary of this ROD in a reasonable time frame. These standards are referred to by this ROD as **in-situ groundwater standards**, or **ISGS**. This reduction shall be accomplished by extraction and treatment of groundwater. This requirement does not apply to the chemical pCBSA. Special actions for pCBSA are discussed in the Decision Summary.
- The reduction of the volume of water outside the containment zone that is contaminated at concentrations above ISGS levels shall be achieved at the groundwater extraction rates and in accordance with the performance standards, requirements, and provisions in the Decision Summary.
- The remedial action shall, while still meeting all other requirements and objectives of the remedial action as specified by this ROD, limit inducing adverse migration of NAPL (residual phase) contaminants. Additional definitions and exceptions with respect to this requirement are provided in the Decision Summary.

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<sup>1</sup>The use of the term "containment zone" in this ROD does not reflect a formal establishment of a containment zone as that term is used in, and per the requirements of, California State Water Resources Control Board Resolution No. 92-49(III)(H).

- The remedial action shall, while still meeting all other requirements and objectives of this remedial action as specified by this ROD, limit the migration of existing contamination where such migration would be of a nature that would lengthen the remedial action, result in a greater potential health risk, or result in spreading of the contamination. Additional definitions and exceptions with respect to this requirement are provided in the Decision Summary.
- Any of several technologies (or combinations of those technologies), identified in the Decision Summary shall be considered acceptable for treatment as determined in the remedial design phase. This remedy shall attain all ARARs identified by this ROD that pertain to any of the technologies that are actually implemented.
- For the chlorobenzene and TCE plumes, groundwater shall be injected back into the aquifers after treatment to standards selected in this ROD. Additional specifications are provided in the Decision Summary.
- For the benzene plume, after treatment groundwater shall be discharged after treatment in one of the following ways as determined in the remedial design phase: (1) discharge to the storm sewer, (2) discharge to the sanitary sewer, or (3) aquifer injection. The discharge shall meet all ARARs identified in this ROD and any independently applicable standards for such discharges.
- Contingent actions, as put forth in the Decision Summary, shall be implemented in the event that the remedial action does not contain groundwater contamination within the containment zone.
- The hydraulics of the affected groundwater aquifers, the nature, extent, fate, and transport of contamination, and compliance with the requirements of this ROD, shall be continually monitored in accordance with the objectives, requirements and provisions presented in the Decision Summary.
- Existing drinking water production wells in the vicinity of the Joint Site shall be routinely monitored for the contaminants from the Joint Site and actions shall be taken to ensure that contamination from the Joint Site does not enter the potable water supply, as provided in the Decision Summary.
- Additional field data shall be acquired during the remedial design phase, including monitoring well data from new and existing monitoring wells, well surveys, aquifer tests, and other data as required and as specified in the Decision Summary.
- Institutional controls are identified in Sections 11 and 13 of the Decision Summary to

reduce the potential for groundwater use in the area of contaminated groundwater presently and during the course of the remedial action and to limit the potential for the spreading of existing contamination during the course of the remedial action.

## **5. Statutory Determinations**

The selected remedy is protective of human health and the environment. In addition, as required by the terms of this ROD, EPA will conduct a second phase of remedial decisionmaking for this operable unit to address unresolved uncertainty regarding whether certain remedial actions selected in this ROD will continue to remain protective of human health and the environment over the long term. This second phase of remedial decisionmaking will address whether and to what degree NAPL recovery and/or NAPL immobilization shall occur at the Montrose Chemical and Del Amo Superfund Sites.

The selected remedy complies with Federal and State requirements that are legally applicable or relevant and appropriate (ARARs) to the remedial action, except where such ARARs have been waived. The waiver of certain ARARs, which are identified in Appendix B and explained in the Decision Summary of the ROD, is justified due to technical impracticability. This waiver applies to a specific zone of groundwater identified by the Decision Summary.

The selected remedy is cost effective and utilizes permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces the mobility, toxicity, or volume as a principal element.



Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of the remedial action, and again every five years subsequently for as long as hazardous substances remain on-site, to ensure that the remedy continues to provide adequate protection of public health or welfare or the environment. As part of these reviews, EPA shall evaluate toxicological studies which may have been performed since the issuance of this ROD to determine whether remedial actions selected in this ROD to address the groundwater contaminant pCBSA remain protective of human health and the environment. This discussed in detail in the Decision Summary of this ROD.

Keith Takata, Director  
Superfund Division  
United States Environmental Protection Agency, Region IX

Date

## II. DECISION SUMMARY

### **1. Site Names and Location**

This record of decision (ROD) documents and establishes the dual-site operable unit remedy for groundwater at the Montrose Chemical and Del Amo Superfund Sites<sup>1</sup> (Figures 1-1 and 1-2) in Los Angeles, California (near the Cities of Torrance and Carson)(See Section 4 of this ROD for the context of this selected remedial action). The EPA CERCLIS identification numbers for these sites are CAD008242711 and CAD029544731, respectively. These separate, but adjacent Superfund sites have commingled groundwater contamination. Groundwater contamination at these two sites originated primarily from (1) the former Montrose Chemical plant and property, which manufactured the pesticide DDT between 1947 and 1982, and (2) the former Del Amo Synthetic Rubber plant and property, which operated between 1942 and 1972. There are other sources of groundwater contamination which are discussed in later sections of this ROD and in the remedial investigation reports. More details are provided in the Section 2 of this ROD, in the Remedial Investigation Reports, and Section 2 of the Joint Groundwater Feasibility Study.

The "Harbor Gateway" is a half-mile-wide strip of the City of Los Angeles that extends south from Los Angeles proper and provides the City a contiguous jurisdiction to Los Angeles Harbor. The former Montrose Chemical and Del Amo plants were located in the Harbor Gateway between the Cities of Torrance and Carson. The former Montrose plant property is at 20201 Normandie Avenue, lying on the west side of Normandie Avenue between Del Amo Boulevard on the south and Francisco Street (extended) on the north. The former Del Amo plant property lies in an area *roughly* bounded by Normandie Avenue on the west, Interstate 110 on the east, 190<sup>th</sup> Street on the north, and Del Amo boulevard on the south. The actual former plant property boundaries can be seen on Figure 1-2. The area surrounding the former plants contains portions of the cities of Carson, Gardena, and Torrance. A strip of land immediately east of the former Del Amo plant, and the residential area directly south of the former Del Amo plant, are part of unincorporated Los Angeles County. Overall, groundwater contamination associated with these

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<sup>1</sup>On February 19, 1999, the United States Court of Appeals for the District of Columbia Circuit overturned EPA's final rule by which EPA had added the Del Amo Superfund Site to the Superfund National Priorities List. [*Harbor Gateway Commercial Property Owners' Association, et al., v. U.S. EPA*, 1999 U.S. App. LEXIS 2504 (D.C. Cir. 1999)] Regardless of the NPL status of the Del Amo Site, it is appropriate to continue to refer to the Del Amo Site as the "Del Amo Superfund Site" because EPA, as the lead agency under the NCP, is continuing to undertake Superfund response actions at and with respect to that site, due to substantial actual or threatened releases of hazardous substances which pose an imminent and substantial endangerment to human health and the environment, and consistent with EPA's delegated CERCLA authority and the NCP [e.g., see 42 U.S.C. §9604(a-b); 40 C.F.R. §300.425(b)(4)].

two sites has come to be located over an area extending more than 1.3 miles in length, but its extent differs widely with the depth of the water-bearing unit as well as the lateral location being considered (see Section 7 of this ROD, Summary of Site Characteristics, for discussion of distribution of contamination and land use characteristics).

## 2. Site History and Enforcement Activities

Figures 2-1, 2-2 and 2-3 show many of the features discussed in this text. Most major sources of contamination at the former Montrose and Del Amo plant properties, as well as minor sources between these major sources, are shown on Figure 2-3a. Areas of known or highly suspected non aqueous phase liquids (NAPL) are shown on Figure 2-3b. Section 2 of the JGWFS (1988), the Montrose Remedial Investigation Report (1988), and the Del Amo Groundwater Remedial Investigation Report (1988) each contain more detail on contaminant sources. See Section 7 of this ROD, Summary of Site Characteristics, for more details and conclusions about contaminant distributions.

### 2.1 Former Montrose Chemical Corporation Plant

Montrose Chemical Corporation operated a technical grade dichloro-diphenyltrichloroethane (DDT) pesticide manufacturing plant at 20201 S. Normandie Avenue in Los Angeles, California from 1947 to 1982. The 13-acre former plant property lies just outside the City of Torrance, in the Harbor Gateway (See Section 1 and Figures 1-1 and 1-2). Historical documents from the time of the plant's operations refer to the plant as "the Torrance plant," and the former plant property has a Torrance mailing address, despite the fact that it was not formally located within the boundaries of the City of Torrance. The layout of the former Montrose plant property is depicted in Figure 2-1.

DDT was one of the most-widely used pesticides in the world until 1972, when the use of DDT was banned in the United States for most purposes. After 1972, Montrose continued producing DDT at the former plant to be sold in other countries. In 1982-1983, the plant ceased operations, was dismantled, and all buildings were razed. Since 1985 there is a temporary asphalt covering over the former plant property, which is otherwise fenced and vacant.

During its 35 years of operation, the Montrose plant released hazardous substances, pollutants or contaminants, into the surrounding environment, including surface soils, surface drainage and storm water pathways, sanitary sewers, the Pacific Ocean, and groundwater. The primary raw materials Montrose used for making the pesticide DDT were *monochlorobenzene* (hereafter, "chlorobenzene") and *trichloroacetaldehyde*, known as "chloral." Montrose placed these in batch reactors in the presence of a powerful sulfuric acid catalyst called oleum. The resulting chemical reaction produced DDT. Chlorobenzene and DDT are two of the primary contaminants found in the environment at the Montrose Chemical Site today. DDT does not significantly dissolve in water but will readily dissolve in chlorobenzene. When in its pure form, chlorobenzene is a dense non-aqueous phase liquid (DNAPL).

An unwanted by-product of DDT manufacture at the Montrose chemical plant was the highly water-soluble compound *para-chlorobenzene sulfonic acid*, or pCBSA. This compound was created when chlorobenzene was directly sulfonated by sulfuric acid in Montrose's operations. To EPA's knowledge, pCBSA occurs in industry only in connection with DDT manufacture. There are no chronic toxicity data, and virtually no acute toxicity data for this compound. There are no promulgated health standards for pCBSA, which is found extensively in groundwater at the Montrose and Del Amo Superfund Sites. Additional information about pCBSA is provided in later sections of this ROD, including Section 8, Summary of Groundwater-Related Risks, and Section 12, Summary of Comparative Analysis of Alternatives and Rationale for Selected Alternative.

Montrose operations included a series of trenches used to convey wastes and a waste disposal pond (impoundment) which received wastewaters, DDT, and chlorobenzene. This pond also received caustic liquors and acid tars. Activities at the plant caused discharges of chemicals to the ground surface and to the waste pond. The soils under the Central Processing Area of the former Montrose plant contain large quantities of chlorobenzene in DNAPL form, as well as chlorobenzene dissolved in groundwater. The DNAPL occurs both above and below the water table. Data collected during the remedial investigation suggest that this DNAPL is a primary continuing source of groundwater contamination.

There were also periodic discharges of contamination from the Montrose plant into the storm water pathway leading from the Montrose plant. The evolution of this pathway and the discharges of wastes into it are described in detail in Chapter 1 of the *Remedial Investigation Report for the Montrose Superfund Site* (Montrose Site RI Report) (EPA, 1998). Some of these discharges may have resulted in standing contaminated water of significant quantity and over sufficient time that groundwater could have become newly or additionally contaminated by recharge from the ground surface.

Chapter 1 of the final Montrose Site RI Report gives additional details on the Montrose operating history. Section 7 of this ROD provides a more-detailed discussion of contaminant distribution; the most detailed description of contaminant distribution can be found in the Montrose Site RI Report, the Del Amo Groundwater RI Report (Dames & Moore, 1988), and the Joint Groundwater Feasibility Study (JGWFS), Section 2 (EPA, 1998). References for these documents are provided in Section 5 of this ROD.

## **2.2 Enforcement Activities Related to the Montrose Superfund Site**

In 1982, EPA conducted an inspection of the Montrose property and determined that DDT was present in surface drainages leading from the Montrose property. In 1983, EPA and the California Regional Water Quality Control Board issued a enforcement orders to Montrose, requiring them to cease and desist their discharge of hazardous wastes to the storm drain and surface water drainages. On October 15, 1984, the Montrose Superfund Site was proposed for the National Priorities List, or NPL. The Site was listed final on the NPL on October 4, 1989. EPA began a remedial investigation of the Montrose Chemical Site under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA). Montrose demolished the former plant and graded the site in 1984 and 1985 without the prior approval of EPA. Montrose covered the entire property, except for an area in the southeastern corner, with an asphalt cap. On February 19, 1988, EPA issued a unilateral administrative order to Montrose requiring Montrose to cover the uncovered portion of the southeastern portion of the site with asphalt (EPA Docket No. 88-10). Montrose ultimately complied with this request.

On October 28, 1985, Montrose and EPA entered into an Administrative Order on Consent (AOC) (EPA Docket No. 85-04) which obligated Montrose to perform a remedial investigation and feasibility study (RI/FS) of the entire Montrose Chemical site. This AOC was subsequently amended twice, once in 1987 and again in 1989. The AOC required that Montrose evaluate the nature and extent of contamination at Montrose under EPA oversight and subject to EPA approval, including surface and deep soils at and surrounding the former plant site, surface soils in neighborhoods, groundwater, sanitary sewers, and surface water pathways. It also required that Montrose perform a feasibility study, subject to EPA oversight and approval, of alternatives for addressing the contaminants in all of these areas.

Montrose installed groundwater monitoring wells in four separate hydrostratigraphic units, installed onsite NAPL wells, drilled and sampled from soil borings on and near the former plant property, and performed a number of other investigation-related tasks. Montrose generated drafts of the remedial investigation report as well as several drafts of feasibility studies related to screening and evaluating alternatives for soils and groundwater. However, Montrose did not modify any of these drafts adequately, nor did Montrose address EPA's comments on these documents sufficiently, such that EPA could approve and finalize the RI or FS documents. In January 1998, pursuant to the provisions of the AOC, EPA took back from Montrose the work to complete the RI Report and EPA completed it using EPA staff and contractor resources.

See discussion below about the JGWFS for further information about enforcement activities after the initiation of the joint remedial effort for groundwater.

### **2.3 The Former Del Amo Synthetic Rubber Plant**

The United States War Assets Administration (this former federal agency was succeeded by the U.S. General Services Administration [GSA]), owned a synthetic rubber manufacturing facility in Harbor Gateway, between the cities of Torrance and Carson, beginning in 1942. The War Assets Administration entered into operating agreements with Shell Oil Company (Shell), Dow Chemical Company, and several other companies, to operate the plant and to produce synthetic rubber for the United States during World War II. In 1955, Shell purchased the facility and began operating it directly. Shell operated the facility until 1972, at which time operations ceased, the plant was dismantled, and the plant buildings were razed. The plant property has been entirely redeveloped with light industrial and commercial enterprises, with the exception of the area at the south-central border of the former plant property, which is owned by Shell and is the location of the "Del Amo Waste Pits" (see below). The site did not take on the name "Del Amo" until later. The former Del Amo synthetic rubber plant property covered 270 acres, roughly 21 times the size of the neighboring Montrose plant property.

The layout of the former Del Amo plant property is depicted in Figure 2-2. The Del Amo plant had three sub-plants within it, commonly called "plancors." The styrene and butadiene plancors produced styrene and butadiene, respectively, and the rubber plancor chemically combined styrene and butadiene to make synthetic rubber. Of the three plancors, it has been shown that the majority of the contamination (there are exceptions) is found in the area of the former styrene plancor, in which large quantities of liquid benzene and ethylbenzene were stored and used. Over the years of its operation, the Del Amo plant released hazardous substances, pollutants, or contaminants into the surrounding environment. There are, at a minimum, eleven areas at the former Del Amo plant, nine of which are in the styrene plancor, which are under investigation as sources of benzene NAPL to the subsurface (See Figure 2-3a, Item Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12; and also Figure 2-3b). In some of these areas, the evidence of NAPL is conclusive because NAPL has been directly encountered. In the other areas, the evidence of NAPL presence is very strong, but based on deduction from indirect indicators. These areas remain under further investigation by Shell Oil Company and Dow Chemical Company under the oversight of EPA.

All of these NAPL sources lie within or close to the distribution, or "footprint", of the observed groundwater contamination. The "MW-20 area," so-named because it is near monitoring well MW-20, lies near a former benzene storage tank of at least a half-million gallons capacity (Item No. 3 on Figure 2-3a; also shown on Figure 2-3b). South of MW-20 is a tank farm which stored benzene and ethylbenzene (Item No. 6 on Figure 2-3a; also shown on Figure 2-3b).

At the southern boundary of the former Del Amo plant property are the unlined "waste pits," in which both tarry and aqueous wastes were discharged, including wastes containing benzene, ethylbenzene, and naphthalene (Item No. 10 on Figure 2-3a; also shown on Figure 2-3b). The

waste pits also received surfactants which may account for unusual contaminant migration patterns under the pits. While the pits have a thick soil cover, there is still 55,000 cubic yards of viscous waste remaining in the pits underground. In September 1997, EPA signed a ROD for an operable unit remedy for the waste pits. Pursuant to that selected remedy, an engineered impervious cap complying with requirements of the Resource, Conservation and Recovery Act (RCRA) will be constructed over the waste, which will be left in place. In addition, soil vapor extraction (SVE) will be performed on the soils under the waste. This remedial action is currently in the remedial design phase.

On the eastern end of the former rubber plant lies another area with extensive benzene contamination in soils and groundwater (Item No.12 on Figure 2-3a; also shown on Figure 2-3b). Plant history indicates the presence of laboratories, above-ground pipelines, chemical storage and processing areas, and wastewater treatment areas. All of these have been the subject of the Superfund remedial investigation effort, and some remain under investigation. Enough information is known, however, to select the remedial actions set out in the ROD for groundwater.

In the southeastern area of the former Del Amo plant site, directly east of the waste pits, is another area with confirmed benzene NAPL contamination (Item No.11 on Figure 2-3a; also shown on Figure 2-3b). The source of this benzene is not immediately apparent, though there was a major pipeline in this area while the plant was in operation.

## **2.4 Enforcement Activities Related to the Del Amo Superfund Site**

On May 7, 1992, EPA, Shell Oil Company (Shell), and Dow Chemical Corporation (Dow) entered into an Administrative Order on Consent (AOC) (EPA Docket No. 92-13) which required Shell and Dow, acting as "the Del Amo Respondents," to perform a remedial investigation and feasibility study for the Del Amo site, including the entire 270-acre former plant site. Among the requirements of this AOC was that the Del Amo Respondents perform a 2-phase remedial investigation, a feasibility study, and several focused investigations, including the NAPL near well MW-20, as well as a focused investigation/feasibility study for the Del Amo Waste Pits. To date the Del Amo Respondents have produced a draft Phase I remedial investigation report, a final groundwater remedial investigation report (see below), a final focused feasibility study for the waste pits area, a series of reports and documents related to its investigation of the NAPL at MW-20 and a pilot NAPL hydraulic extraction test (treatability study) for that area, a report on NAPL near monitoring well P-1 and the transmission pipelines, and numerous other satellite documents. The Phase I RI report was never finalized by the Respondents, with the agreement that EPA's comments on that document would be addressed in the final RI and that the draft Phase I RI would not be referenced. Phase II work is now in progress.



When the joint groundwater work was initiated, EPA acknowledged that a separate remedial investigation report would be needed for the Del Amo Site which addressed groundwater only, while all remaining aspects of the remedial investigation would need to be documented in a separate report which would be issued later. The Del Amo Respondents voluntarily agreed to produce a "Del Amo Groundwater Remedial Investigation Report," which was completed to EPA's satisfaction in May of 1998.

## **2.5 Enforcement History Related to the Joint Groundwater Remedial Effort**

Because the investigation of the Montrose Chemical Site had begun earlier than that for the Del Amo Site, originally there had been insufficient data to determine (1) the degree to which groundwater contamination from the Montrose and Del Amo Sites were commingled, and (2) the degree to which contamination from the Montrose Chemical Site might be affected by remedial actions that were being considered in feasibility studies for groundwater at the Montrose Chemical Site. The Montrose remedial investigation had identified the existence of extensive Del Amo-related groundwater contamination, but initially the remedial investigation at the Del Amo Site had not progressed to the point that this contamination was adequately defined. Accordingly, EPA considered selecting limited interim groundwater remedies for the Montrose Chemical Site until these factors could be resolved.

However, by late 1995, sufficient data had been obtained from the Del Amo groundwater investigation to determine that (1) the groundwater contamination from the two sites was commingled, and (2) the evaluation of remedial alternatives related to groundwater contamination at one site was inseparable from the same evaluation at the other site. Groundwater contamination at both sites had to be considered together in order to properly evaluate and select groundwater alternatives for the two sites (See Section 4, Context, Scope and Role of the Remedial action, in this ROD).

In late 1995 and early 1996, EPA informed and opened a dialogue with Montrose Chemical and the Del Amo Respondents (Shell Oil Company and Dow Chemical Company) that EPA intended to unite the remedial selection processes with respect to groundwater, thereby leading to a single feasibility study and a dual-site groundwater ROD. EPA initiated a process to generate a single feasibility study, called a Joint Groundwater Feasibility Study (JGWFS) to provide analysis for this ROD. While the separate AOC documents did not directly discuss a JGWFS, the parties agreed to proceed with the joint work as envisioned by EPA on a voluntary basis.

In March of 1996, a joint groundwater modeling effort was initiated. This technical effort was intensely overseen by EPA and was carried out by technical consultants to both parties. A series of meetings occurred from one to three times per month for six months in which a sophisticated

groundwater flow and contaminant transport model was developed. The model was run and results compiled in late 1996. Summary details, results, and limitations of this model are discussed in a later section of this document. Those wishing technical or complete detail are referred to the Joint Groundwater Feasibility Study (EPA, 1998).

While the draft JGWFS was due on March 10, 1997, the joint parties did not submit the draft document to EPA until May 20, 1997. Upon reviewing this document, EPA found it highly deficient and misleading in numerous respects (*See* A.R. No. 4742; EPA DCN 0639-03730). EPA formally took over the work to complete the JGWFS on August 14, 1997. EPA found that while the modeling effort was technically sound and usable, the draft JGWFS report required wholesale revision. EPA took over the work and rewrote the JGWFS, and released the public comment draft on June 26, 1998. The JGWFS is considered final with the issuance of this ROD.

In January, 1998, EPA took over the effort to complete the Montrose Site RI Report after Montrose did not produce an acceptable draft after almost a decade of multiple iterations of Montrose drafts and comments by EPA. EPA completed its revision to this draft document on June 26, 1998. This was referred to as the "Public Comment Draft."

The Del Amo Respondents completed the Groundwater Remedial Investigation Report pertaining to the Del Amo Site on May 18, 1998, in accordance with EPA's comments and EPA has approved that document.

Both Montrose Chemical and the Del Amo Respondents completed the *Joint Groundwater Risk Assessment* in accordance with EPA comments in February, 1998. This document was approved by EPA as amended by EPA's *Supplement to Joint Groundwater Risk Assessment* (EPA, 1988).

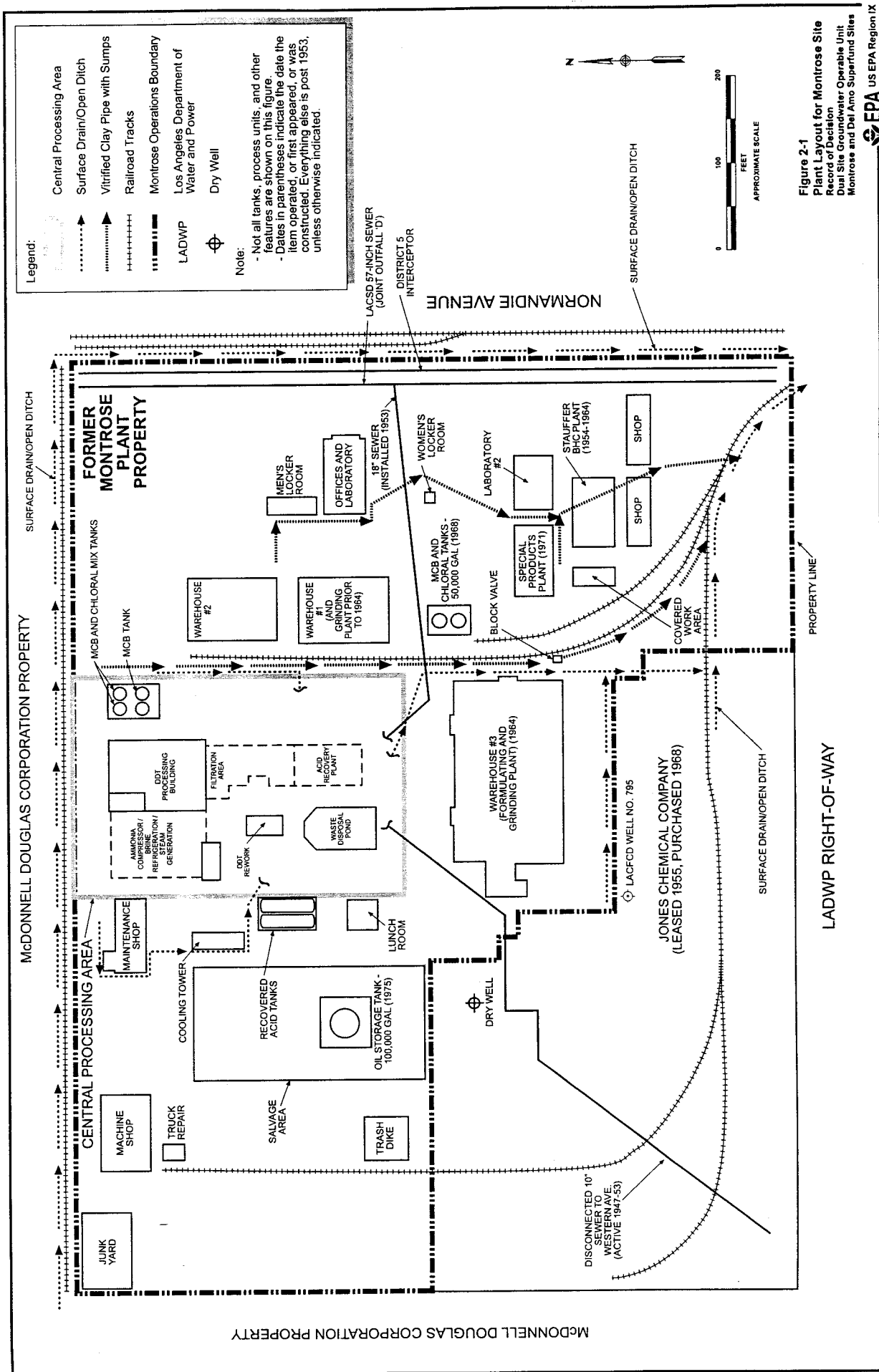
## **2.6 Contaminant Sources Other Than the Montrose Chemical and Del Amo Plants**

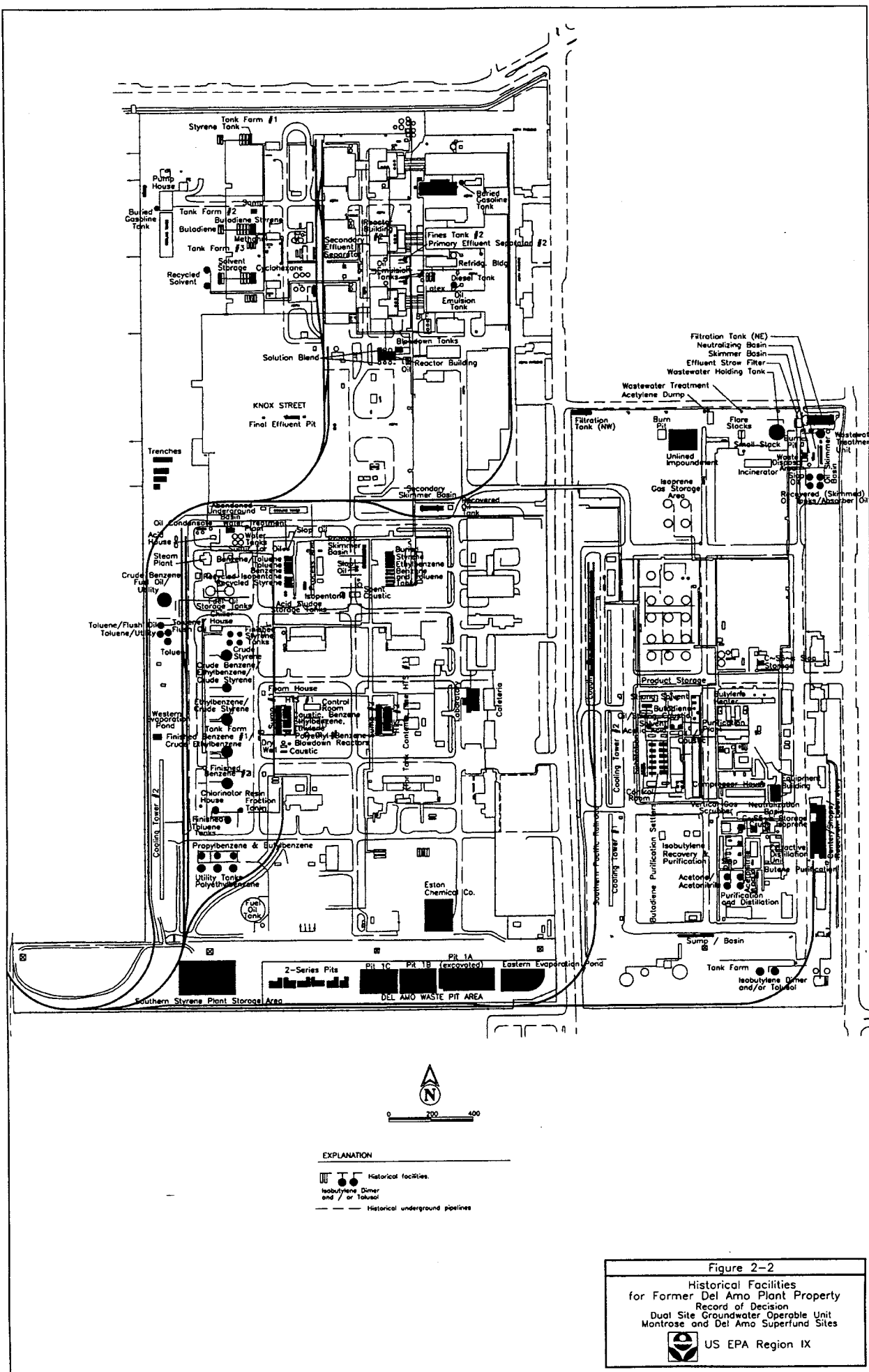
Within the Joint Site (See Section 6 for formal definition of Joint Site), there are several actual or potential sources of benzene and chlorinated solvents in addition to the former Montrose Chemical plant and former Del Amo plant. Montrose Chemical is the only known source of chlorobenzene, DDT, and pCBSA to groundwater at the Joint Site. As part of the Joint Site, these sources are by definition either entirely within the current area of groundwater contamination from the Montrose Chemical and Del Amo Sites, partly within it, or sufficiently close that contamination will have to be addressed as part of the remedial action selected in this ROD (See Section 6 of this ROD for definition of the term, "Joint Site."). *This section is intended for the purposes of providing background and does not necessarily identify all such sources.* The sources are listed below with the likely primary contributing contaminant in parentheses (). Other contaminants may also be present in each case, as identified by Section 7

of this ROD and the remedial investigation reports for this remedial action, as referenced in Section 5 of this ROD.

- **Petroleum transmission pipelines (benzene).** A series of petroleum transmission pipelines, unrelated to the former Montrose and Del Amo plants, have been and still are used to transfer petroleum products from the port to the refineries in the area (Figure 2-3a, Items "K," "M," and "N"). There are several locations directly under these pipelines where groundwater concentrations are indicative of the likely presence of benzene NAPL and which may be related to these pipelines. The pipelines occur in separate bundles. Most of these bundles run in an east-west direction just south of both the former Montrose Chemical and Del Amo plant properties. One suspect location along this pipeline is south of Montrose along the pipeline, and east of the Jones Chemicals facility (See below for discussion of Jones). Another bundle is a feeder line that runs in a north-south direction into the east-west transmission line, parallel to Berendo Avenue south of the former Del Amo plant. Petroleum NAPL containing benzene has been directly observed along this feeder line near historical groundwater monitoring well P-1.
- **Stauffer Chemical (benzene).** A potential source of benzene in groundwater near the former Montrose plant is Stauffer Chemical, which historically operated a chemical plant on the Montrose property that manufactured benzene hexachloride (BHC), another pesticide. BHC manufacture requires benzene as a feedstock. In the process, benzene is chlorinated to form BHC. The gamma isomer of BHC is known as lindane.
- **Montrose (benzene).** A potential source of benzene in groundwater near the former Montrose plant is the benzene that occurred in raw chlorobenzene, most likely at a rate of less than 1%. Because of the copious quantities of chlorobenzene released, this could account for some of the benzene contamination in groundwater.
- **The Jones Chemicals, Inc. plant (TCE, PCE, DCE, and benzene).** This plant manufactures bleach and sells other chemical products in bulk and has been in operation immediately south of the former Montrose plant since the mid-1950s (Items "J" and "L" on Figure 2-3a). Based on investigations by EPA and the State of California, Jones Chemicals, Inc. is known to have discharged chlorinated solvents to a dry well on their property. Likewise, there are fuel tanks which may have leaked petroleum products into the subsurface. Jones also stored PCE on its property in bulk, packaged PCE in drums, and sold PCE for a number of years. Jones also operated a drum washing facility which was also a likely source of chlorinated aliphatic solvents released to the subsurface.
- **Solvent-handling Facilities (TCE, PCE)** There are facilities near 196<sup>th</sup> Street at the western border of the former Del Amo plant which have handled chlorinated solvents and

have soils with significant concentrations of these solvents (Item No. 2 on Figure 2-3a; also shown on Figure 2-3b). The operations at these facilities occurred or continue to occur subsequent to the closure of the Del Amo plant.







0 600 1200

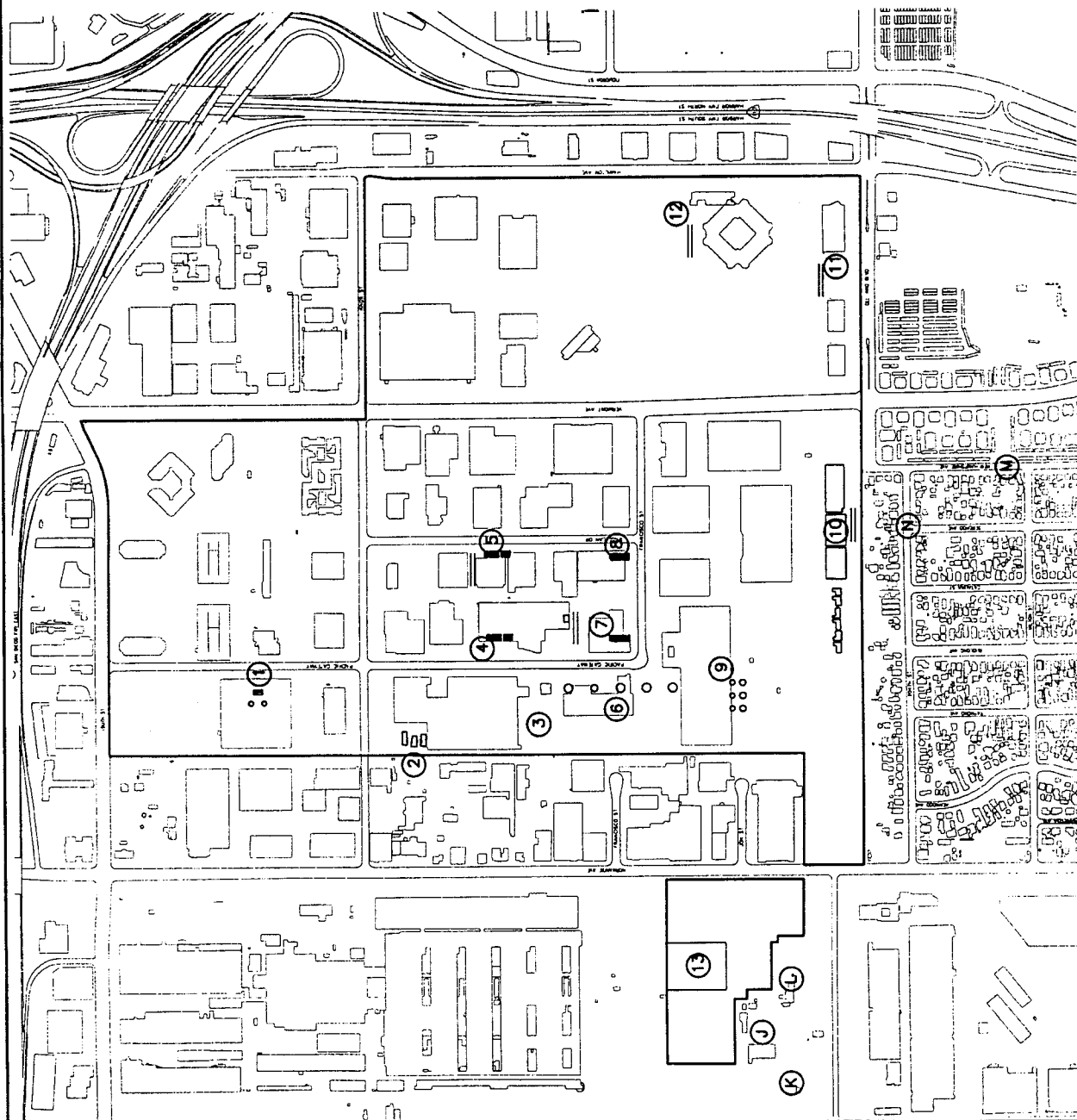
### EXPLANATION

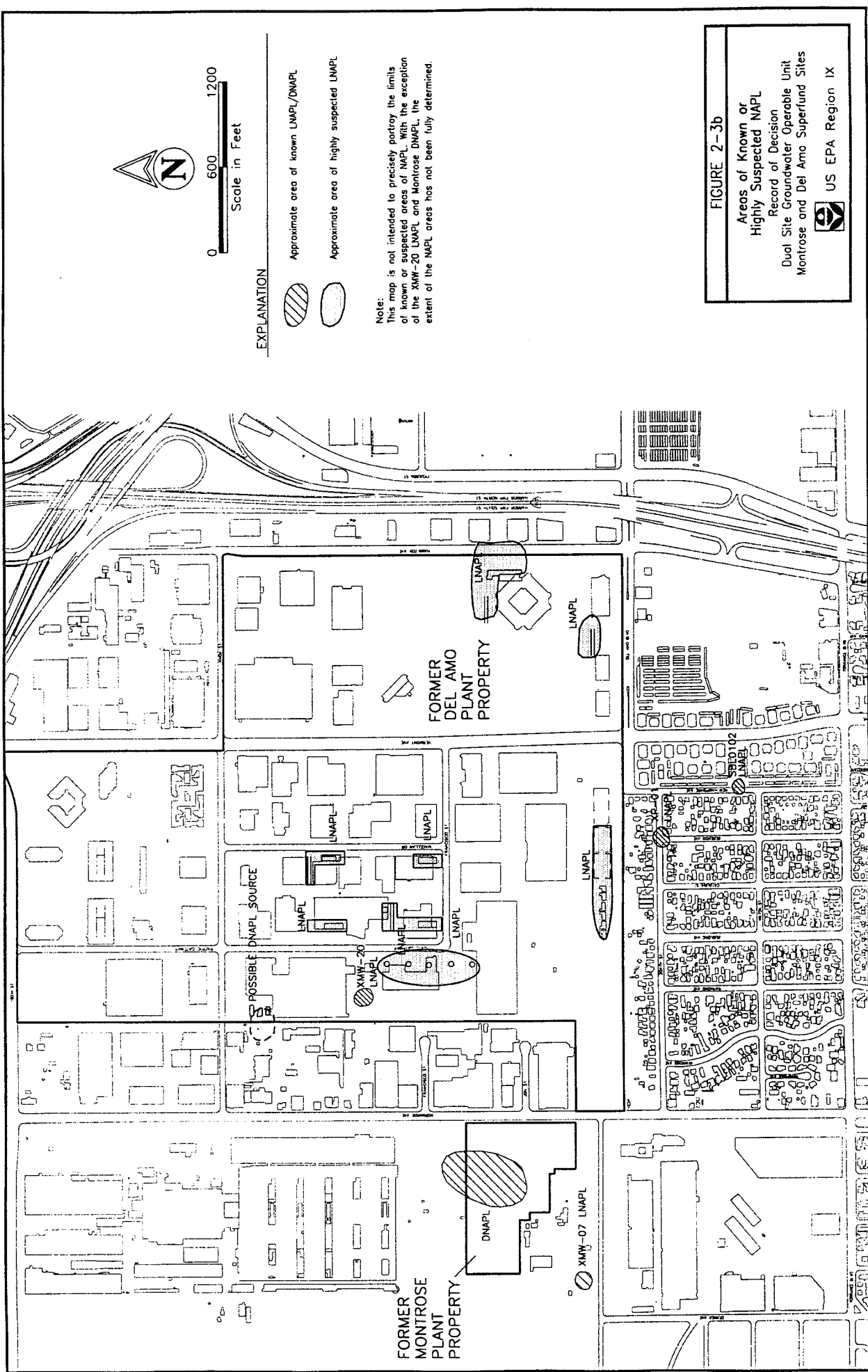
⑨ Approximate location of groundwater contamination source areas

| Source Area Number | Suspected Former Source Facility   | VOCs with Elevated Concentrations in Groundwater |
|--------------------|--|--|
| 1                  | Former Del Amo Plant Property cyclotriene tanks  | cyclotriene                                      |
| 2                  | Former Del Amo Plant Property pits and trenches and/or solvent facility                        | TCE<br>PCE<br>chloroform                         |
| 3                  | Former Del Amo Plant Property (benzene tank and/or pipeline)                                   | benzene (LNAPL)                                  |
| 4                  | Former Del Amo Plant Property VOC tanks in styrene finishing/benzene purification unit         | benzene<br>ethylbenzene<br>cyclohexane           |
| 5                  | Former Del Amo Plant Property VOC tanks and/or underground pipelines in styrene finishing unit | BTX<br>styrene<br>naphthalene                    |
| 6                  | Former Del Amo Plant Property tank farm (VOC storage)  | benzene<br>ethylbenzene                          |
| 7                  | Former Del Amo Plant Property VOC storage tanks at ethylbenzene production unit                | benzene<br>ethylbenzene                          |
| 8                  | Former Del Amo Plant Property VOC storage tanks at ethylbenzene production unit                | benzene<br>ethylbenzene<br>phenol                |
| 9                  | Former Del Amo Plant Property utility tanks  | benzene<br>toluene                               |
| 10                 | Former Del Amo Plant Property Waste Pit Area and underground petroleum product pipelines       | BTX<br>naphthalene<br>phenol                     |
| 11                 | Former Del Amo Plant Property underground benzene pipeline                                     | benzene<br>phenol(?)                             |
| 12                 | Former Del Amo Plant Property laboratory, underground pipelines (?)                            | BTX<br>styrene<br>cyclohexane<br>naphthalene     |
| 13                 | Former Montrose Plant Property (DNAPL) central process area                                    | chlorobenzene (DNAPL)<br>benzene                 |
| N                  | Pipelines  | benzene<br>naphthalene                           |
| K                  | Pipelines  | BTX<br>1,1-DCA                                   |
| J, L               | Jones Chemical   | TCE, PCE, 1,1-DCE,<br>1,1-DCA, benzene           |
| M                  | SSL 102 LNAPL  | petroleum hydrocarbons                           |

FIGURE 2-3a

Former Montrose and  
Del Amo Plant Properties  
Groundwater Contamination Source Areas  
Record of Decision  
Dual Site Groundwater Operable Unit  
Montrose and Del Amo Superfund Sites  
US EPA Region IX







### **3. Highlights of Community Involvement Activities**

#### **3.1 Communities and General Community Involvement**

A community relations plan was developed and issued by EPA in July of 1985 (EPA DCN 0639-00482). EPA issued an updated community relations plan in November of 1996 (EPA DCN 0639-02277). These plans were issued in accordance with EPA guidance to facilitate the Community involvement with respect to all Superfund actions for the Montrose Chemical and Del Amo Sites. This plan has been followed by EPA with respect to general community involvement as work at the two sites has proceeded over more than a decade.

EPA has maintained a mailing list database, which is updated on a continuous basis, and has issued fact sheets to persons and business entities on this mailing list throughout the Superfund project, which began for the Montrose Chemical Superfund site in 1983 and for the Del Amo Superfund site in 1991. As discussed earlier in this ROD, there are many aspects of the Montrose Chemical and Del Amo Superfund sites which are undergoing separate investigation and cleanup actions; groundwater is one of these actions and is being addressed in a dual-site manner. Beginning in 1983 and onward, EPA issued fact sheets to the mailing list and to any parties interested in the Superfund sites, addressing either some or all of the various actions and investigations underway. Groundwater was among these actions and investigations. These fact sheets provided the public with historical and up-to-date data and information about the sites and EPA's approach to the sites. They also encouraged the public to approach EPA with any concerns and comments they may have, and gave an opportunity to add or remove names from the mailing list.

During the period 1983 to 1993, community interest in these sites was modest. In 1993, fill material contaminated with DDT was found in residential yards along 204<sup>th</sup> Street, which were immediately adjacent to the former Del Amo waste pits. A community group, the Del Amo Action Committee, was formed at that time. Over time, this group took up the broader issues of health concerns and possible contamination throughout the wider neighborhood. Other groups and individuals with other interests and positions also existed in the community near the Montrose Chemical and Del Amo sites. Beginning in 1994, to address issues associated with the temporary relocation of some neighborhood residents and other concerns in the neighborhood, EPA substantially increased its community relations effort, including meetings and workshops monthly and as often as weekly, numerous fact sheets, special hot-lines, and media relations.

Although a majority of community involvement since 1994 has been focused on actions related to neighborhoods and neighborhood soils, EPA often "piggybacked" on these efforts (meetings,

fact sheets, etc.) to provide the community with reports on progress, data, and changes in approach with respect to the groundwater investigation and feasibility study.

In 1997, members of the community, the Del Amo Action Committee, the EPA, agencies of the State of California, and many local agencies, formed a group called the Montrose and Del Amo Neighborhood Partners, which now meets regularly. EPA provides information to this group on groundwater and has received feedback on concerns related to groundwater.

### **3.2 Information Repository**

EPA has maintained an information repository at the Torrance and Carson public libraries with hard copies of selected critical documents related to the investigation and response actions for the Montrose Chemical Superfund site and the Del Amo Superfund site. This repository contains the administrative record for the remedial action selected by this ROD.

### **3.3 Community Involvement Activities** **Specific to the Proposed Plan for the** **Groundwater Remedial Action Selected by this ROD**

On April 17, 1997, EPA held an informational workshop about groundwater geared to the segment of the community without substantial scientific background. EPA advertised the meeting via a flyer sent out on our mailing list. The EPA remedial project manager (RPM) and community involvement coordinator (CIC) used a computer-generated slide show, various demonstration aids, and a groundwater model as visual aids to explain: (1) the nature and operational history of the sites, (2) what groundwater is and how water moves in aquifers and aquitards, (3) the extent of contamination in each aquifer at the Joint Site<sup>1</sup>, (4) what non-aqueous phase liquids are and how they behave, (5) why some of the groundwater cannot be cleaned up fully, (6) the approach of using a NAPL isolation zone and restoring groundwater outside that zone, (7) the concept of intrinsic biodegradation, (8) the concept of groundwater pumping for containment or for full cleanup, and (9) some possible types of generalized actions EPA might take to address the groundwater. This meeting took place prior to the release of the Joint Groundwater Feasibility Study and was designed to be a primer to help people understand the proposed plan when it was issued. Approximately 50 people attended. EPA answered questions of the community during this workshop and fielded concerns to take back into the remedy development process.

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<sup>1</sup>See Section 6 for formal definition of Joint Site.

In May 1998, the CIC approached both the Del Amo & Montrose Partnership as well as the Del Amo Land Use Community Advisory Panel and offered to provide them with additional workshops or briefings on EPA's proposed groundwater remedy prior to the Dual Site Proposed Plan Public Meeting. Neither group accepted our offer, preferring to participate at the public meeting instead.

On June 26, 1998, EPA released two versions of the *Proposed Plan; Dual Site Groundwater Operable Unit, Montrose and Del Amo Superfund Sites*. Both versions of the plan were made available in English and Spanish. One version, the general fact sheet version, was less technical and was targeted primarily at the average person. The technical and expanded version was more technical in its terminology and analysis, was much longer, and was aimed primarily at the technical community. Each version was written to serve as a stand-alone document. Any person could receive either or both versions, in either language, upon request. The following activities accompanied this release:

- The general fact sheet version was sent to the mailing list of approximately 1900 individuals, and informed them about how to receive a copy of the technical and expanded version of the proposed plan if desired;
- The general fact sheet version was made available to anyone else who requested a copy;
- The general fact sheet version was posted on the Del Amo/Montrose web site; (URL: <http://www.epa.gov/region09/waste>)
- The technical and expanded version was sent to the Montrose/Del Amo Neighborhood Partners, potentially responsible parties, their attorneys and representatives, and anyone who requested a copy;
- The availability of the fact sheet and the administrative record file, and the commencement date and duration of the public comment period, were published in a local newspaper announcement; and
- A press release was issued announcing EPA's proposal, the availability of the proposed plan and administrative record file, and the commencement and duration of the public comment period.

On July 1, 1998, the administrative record file for the Dual Site Groundwater Operable Unit was made available in the Torrance and Carson public libraries, on microfilm. Selected critical documents, including the remedial investigation reports, the Joint Groundwater Feasibility Study

(JGWFS), the Joint Groundwater Risk Assessment, and EPA's supplement to the risk assessment were made available in hard copy in the libraries.

On July 2, 1998, EPA opened a formal public comment period on the proposed plan and administrative record file. The original notice provided that the comment period would have a duration of 30 days and close on July 31, 1998. Subsequently, in response to requests by members of the public, EPA extended the public comment period by an additional 30 days, to August 30, 1998. An announcement of this change was placed in the same local newspaper which carried the original announcement. The public comment period spanned a total of 60 days. Because August 30 fell on a Sunday, EPA considered comments that were received or postmarked on or before Monday, August 31, 1998.

A formal public meeting on EPA's proposed plan and administrative record file was held during the afternoon on Saturday, July 25, 1998 at the Torrance Holiday Inn on Vermont Street. EPA presented an in-depth presentation about groundwater and EPA's proposal, using computer graphics and slides, and a highly sophisticated model with dye representing contaminants under the ground. EPA summarized the problems posed by the two sites. The information provided in the April 17, 1997 workshop was largely repeated and expanded upon. EPA answered the public's questions during and after this presentation. The EPA presentation was followed by a formal comment period. Both EPA's presentation, the questions and answers, and the formal comment period were transcribed by a court reporter. Approximately 35 people attended, including representatives of Del Amo Action Committee, the Del Amo Land Community Advisory Panel, local businesses, and other members of the general public. Comments read into the record during the formal comment portion of the public meeting were addressed by EPA prior to issuance of this ROD. EPA's responses can be found in the response summary.

## 4. Context, Scope and Role of the Remedial Action

This operable unit remedy addresses cleanup of contaminated groundwater and the containment of dissolved phase contamination surrounding non-aqueous phase liquids (NAPL), with respect to *both* the Montrose Chemical and the Del Amo Superfund Sites.<sup>1</sup> EPA refers to this action as a *dual-site operable unit remedy*. The term “dual site” refers to its application to two Superfund sites within a single ROD. As an operable unit remedy, this remedy addresses only a specific portion of all contamination at the Montrose Chemical and Del Amo Superfund Sites. Overall site remedies will, and other operable unit remedies may, be selected for each of the sites. Subsequent amendments to this ROD may be on either a dual-site or site-specific basis, as determined appropriate by EPA.

This ROD establishes remedial actions and standards that differ among various areas of groundwater within the Montrose and Del Amo Sites. The ROD defines these areas both laterally and with depth (i.e. 3-dimensionally) within the system of hydrostratigraphic units present at the Joint Site<sup>2</sup>. This is because (1) the nature and extent of NAPL contamination has made it necessary to address contaminated groundwater that is near NAPL differently than contaminated groundwater at a greater distance from NAPL, and (2) there are physical differences among the various areas of dissolved phase contamination within the overall contaminant distribution that justify differing goals and actions. The details of these distinctions are summarized later in this ROD.

This ROD contains multiple specialized issues and approaches which require substantial discussion. As just mentioned, the ROD utilizes a dual-site approach, and selects differing actions for multiple areas of groundwater. In addition, this ROD 1) reflects only the first of two phases of remedy decisionmaking with respect to this operable unit, 2) includes a waiver of certain applicable or relevant and appropriate requirements based on technical impracticability for a defined area of groundwater, and 3) relies on more than one general response action (both intrinsic biodegradation, a form of natural attenuation, as well as hydraulic extraction and treatment) to meet remedial objectives. This section places these factors and the remedial approach being used into context so as to define the scope of the remedial action clearly and provide a contextual backdrop for the other sections of this document.

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<sup>1</sup>Groundwater at the Montrose Chemical and Del Amo Sites is contaminated by hazardous substances and other pollutants or contaminants as defined by Section 101 of CERCLA, 42 U.S.C. §9601, and/or listed by EPA as CERCLA hazardous substances in 40 C.F.R. Table 302.4. *See also* 40 C.F.R. §302.4.

<sup>2</sup>See Section 6 for formal definition of the term “Joint Site.”

#### **4.1 Dual-Site Basis and Approach**

The groundwater contamination from the Montrose Chemical and Del Amo Superfund Sites has partially commingled, or merged. Originally, EPA oversaw separate remedial investigations and feasibility studies for groundwater at the two sites. However, EPA has found that factors and considerations related to evaluation of remedial alternatives and implementation of remedial actions for groundwater at these sites is inextricably related. Remedial actions taken for groundwater at one site will, to some extent, affect remedial actions taken at the other site, either by affecting the type of action taken or the manner in which the action is implemented, or both.

The groundwater contamination at these two sites presents as one interrelated technical problem. This is not to say that there are not technical distinctions worth identifying and considering between the Montrose and Del Amo Sites with respect to groundwater contamination and these have been considered by EPA, as appropriate. However, it is appropriate to frame a single remedy selection process for groundwater at the two sites. The nature and extent of contamination and the nature of the EPA Superfund remedy selection process lead to the following conclusions:

1. The implications of possible remedial actions for one site must be viewed in the context of those being considered for the other site;
2. The remedial actions for both sites must be mutually consistent; and
3. The nine remedy selection criteria in the National Contingency Plan (NCP) must not be evaluated in terms of either site alone, but in relation to the groundwater contamination from both sites as a whole.

As an example, a principal goal of the JGWFS was to evaluate the degree to which groundwater contamination at either site may be adversely moved by remedial actions being considered for the groundwater contamination at the other site. Likewise, consideration was given to whether taking certain actions for one site might affect the range or latitude of options for, or the efficacy of, addressing the other site. Such factors had to be considered together, both in time and within a single vehicle.

As another example, objectives strongly valued at one site, such as cleaning up more quickly and/or keeping existing contamination contained, bring about consideration of actions at the other site, or make some results at the other site more acceptable than they would otherwise be when considered alone. A balancing among the "site-specific" objectives is required.

Attempts to separate evaluations of remedial alternatives independently "by site" would have become artificial and awkward. The likely result of such an effort would have been two largely redundant and duplicative remedy selection processes, each with a set of reports straining to confine its evaluation of criteria within the sphere relating to one site, when the considerations needed cross site boundaries and pertain to the interrelated dual site. Such an approach also would have presented the formidable administrative risk of being either technically or administratively inconsistent and making the remedy selection process muddled or incomprehensible to the public.

Accordingly, EPA has employed a unified process of evaluation, public comment, and remedy selection to apply to this groundwater operable unit at both sites. Using a unified approach has: (1) provided for technical consistency and completeness, (2) minimized and simplified the administrative process of remedy selection, and (3) facilitated public understanding and the ability of the public to comment on the remedy when it was proposed to the public.

#### **4.2 Site-Wide Context of This Operable Unit**

Table 4-1 shows the contaminated media affected by each of the Superfund sites. The operable unit remedy selected in this ROD addresses only groundwater and NAPL, the first two items under each site in Table 4-1. EPA is conducting separate investigations and planning separate remedy selection processes for the other affected media at these sites, as shown in Table 4-1. The other affected media, and the activities being undertaken to address them, are not covered by this document or this remedy. The interim provisions of an operable unit ROD for the Del Amo Waste Pits, issued September 5, 1997, are finalized by this ROD.

#### **4.3 The Problem Posed by NAPL at the Joint Site**

The presence of NAPL contamination at both the Montrose and Del Amo sites strongly influences (1) the nature and scope of this remedy, (2) the remedial approach used in all remedial alternatives considered, and (3) the evaluation of alternatives. While more information is provided on NAPL and its distribution in later sections, a discussion is provided here to establish how NAPL relates to these contextual aspects.

At most sites where it occurs, contamination in groundwater is present in one of three forms: (1) dissolved in the water, called *the dissolved phase*; (2) adsorbed to soil particles, called *the sorbed phase*; and (3) as non aqueous phase liquid, called the *residual phase* or *NAPL phase*. Contaminant mass can be transferred among these three phases as subsurface conditions change. Generally speaking, NAPL is the presence of the pure, undissolved form of a chemical which is a liquid at standard temperature and pressure and which has a low enough water solubility that it is significantly immiscible with water and can exist as a separate phase when present in water. The

term "NAPL" does not refer to the chemical content of a substance but rather to its form. Many chemicals and mixtures of chemicals display NAPL properties but their chemical composition can only be resolved with site-specific sampling and analysis.

NAPL is usually associated with one or more of the following characteristics: (1) high interfacial tension with the water phase; (2) a density difference with the water phase; (3) movement that is dominated more by the relative saturations of NAPL/water/air, buoyancy forces, gravity and capillary pressures, rather than by hydraulic gradients, and (4) heightened viscosity. However, it is important to note that there are many chemicals for which the NAPL form is not highly viscous. An example of this is chlorinated aliphatic solvents. NAPL that has density less than the density of water is called "light non-aqueous phase liquid," or "LNAPL," and NAPL with density greater than that of water is called "dense non-aqueous phase liquid," or "DNAPL."

EPA's experience at Superfund sites is that NAPL often creates serious challenges for remedial efforts. This is because, on the one hand, it dissolves into groundwater and causes high concentrations of contaminants (up to the solubility limit) in groundwater; yet, on the other hand, complete dissolution of NAPL takes a very long period of time, and it cannot be easily flushed and removed from the aquifer. It can be exceedingly difficult to determine with a significant or reasonable degree of certainty: (1) the location of NAPL at a site, (2) the distribution of NAPL, (3) the total NAPL mass, and (4) the lowest elevation in the subsurface at which NAPL occurs ("bottom of the NAPL-contaminated zone"). NAPL can remain in the soils indefinitely, either above or below the water table, where it continually dissolves, either directly into groundwater, or into soil moisture which percolates into groundwater. In this way, NAPL represents a continuing and often recalcitrant source of dissolved phase contaminants into groundwater. Once in groundwater, the movement of the dissolved contaminants is controlled by the processes of advection, dispersion, retardation, and degradation. Figure 4-1 provides a simple depiction of this process. In order to clean groundwater when a NAPL source is present, the NAPL must either be removed, destroyed, or isolated; otherwise, continuing dissolution from the NAPL will re-contaminate groundwater which has been cleaned.

NAPL is present in many areas in the subsurface at the Montrose and Del Amo Sites, surrounded by larger areas of dissolved-phase contamination in groundwater. At these sites, NAPL is present under conditions such that it is technically impracticable with existing technologies to remove enough NAPL to reduce groundwater concentrations to health-based standards at all points in the groundwater plume. Attaining groundwater standards in the midst of the NAPL-impacted areas would require virtually complete elimination of the NAPL from the ground, which EPA has determined to be technically impracticable. This is further discussed and supported in Section 10 of this ROD.



#### **4.4 Use of a Containment Zone for NAPL**

This operable unit remedy isolates the NAPL within a *containment zone*.<sup>3</sup> The containment zone includes both NAPL and some dissolved phase contamination surrounding the NAPL. Dissolved phase contaminants within the containment zone will be prevented from escaping the containment zone by the remedial actions selected by this ROD. These actions thereby isolate the NAPL and the dissolved phase contamination *inside* the containment zone, from the dissolved phase contamination and clean groundwater *outside* the containment zone. The size of the containment zone is limited in size based on technical principles (discussed in Section 10 of this ROD and Appendix E of the JGWFS).

NAPL dissolution continues to occur within the containment zone, therefore, concentrations of contaminants within the containment zone cannot be appreciably reduced; the containment zone must be contained indefinitely. However, once the containment zone is established, the dissolved phase contamination *outside* the containment zone can be cleaned up to health-based standards because NAPL dissolution no longer effects the groundwater outside the containment zone. All alternatives that EPA considered prior to selecting this remedy (except for the No Action Alternative) assumed that NAPL was isolated within a containment zone in this way. This concept is depicted in Figure 4-2.

Two means are utilized within this ROD for achieving containment of dissolved phase contaminants within the containment zone: (1) hydraulic extraction and treatment, and (2) reliance on intrinsic biodegradation. The application of these means vary depending on the area of groundwater being addressed. This is further discussed in Sections 11 and 12 of this ROD with Sections 7, 9 and 10 providing significant supporting information.

#### **4.5 Two Phases of Remedy Selection to Address Groundwater and NAPL**

This operable unit remedy represents the first of *two* phases of remedy selection that will address groundwater and NAPL at these sites. This first phase establishes a containment zone and addresses dissolved phase contamination. More specifically, this phase:

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<sup>3</sup>The use of the term "containment zone" in this ROD does not reflect a formal establishment of a containment zone as that term is used in, and per the requirements of, California State Water Resources Control Board Resolution No. 92-49(III)(H).

- (1) ***Contains dissolved phase contaminants in groundwater surrounding the NAPL*** in a containment zone, thereby isolating the NAPL principal threat and the contaminated groundwater immediately surrounding it from the groundwater outside the containment zone; and
- (2) Outside the containment zone, ***reduces dissolved phase concentrations*** of contaminants in groundwater to health-based standards and in accordance with the specifications in this ROD.

The second phase of remedial selection for this operable unit will address whether and to what degree ***NAPL Recovery*** and/or ***NAPL immobilization*** shall occur at the Montrose and Del Amo Sites. This distinction between the two phases is further described as follows.

It is important to make certain distinctions between the dissolved phase and the NAPL phase in order to put the two phases of remedial selection into context. While it addresses NAPL by isolating it within an area of groundwater, this first phase remedial action does *not* address ***NAPL recovery***, which refers to removing the NAPL itself from the ground. The action selected by this ROD, therefore, does not significantly affect the mass of NAPL remaining in the ground.

Also, the actions selected in this ROD prevent the migration of dissolved phase contaminants *in the water surrounding the NAPL*, but do not prevent the migration of the NAPL phase itself. While this ROD requires that the remedial action be designed to prevent or limit *inducing* the movement of NAPL, a certain degree of NAPL movement may occur naturally. EPA has determined that this remedy is protective of human health and the environment. However, the potential for movement of the NAPL phase itself in the future, as well as the lingering mass of NAPL, creates uncertainty with respect to the long-term effectiveness of the remedial actions selected in this ROD, and the ability of those actions to maintain protectiveness of human health and the environment over the long term. To address these uncertainties, EPA is performing a second phase of remedial decisionmaking for this groundwater operable unit.

Some degree of NAPL recovery and/or immobilization of NAPL would likely enhance the long-term effectiveness and certainty of long-term protectiveness of the first phase remedial actions selected by this ROD. When NAPL is recovered from the ground, its mass and saturation are reduced. In principle, this can (1) reduce the amount of time that the containment zone must be maintained, (2) reduce the potential for NAPL to move naturally either vertically or laterally, and (3) increase the long-term certainty that the remedial action will be protective of human health and remain effective. In addition to technologies which physically remove NAPL, there are other technologies which, while not removing NAPL from the ground, may reduce its mobility in place, thereby immobilizing it. Evaluations of the potential for NAPL recovery or immobilization to be effective are underway but have not been completed specifically with respect to the Montrose Chemical and Del Amo Sites.

Whether and to what degree NAPL recovery and/or NAPL immobilization should occur at the Montrose Chemical and Del Amo Superfund sites will be determined in a separate but related second-phase remedial selection process. As of the date of this ROD, EPA is presently overseeing separate feasibility studies (one for the Montrose Chemical Site, and another for the Del Amo Site) that are examining the feasibility of various NAPL recovery and immobilization alternatives. If EPA determines that an additional remedial action is necessary, EPA will select the second phase remedial actions in an *amendment* to this ROD. EPA may issue such an amendment, if any, as a stand-alone document or within the framework of another ROD for the Montrose and Del Amo Site, including final site-wide ROD(s) which may be issued.

Performance of the second phase remedial selection process for this operable unit is authorized by and consistent with the NCP provision at 40 C.F.R. 300.430(f)(5)(iii)(D) which provides that the ROD shall:

...When appropriate, provide a commitment for further analysis and selection of long-term response measures within an appropriate time frame.

The second phase is also in accordance with the *Guidance for Evaluating the Technical Impracticability of Groundwater Restoration* [EPA OSWER Directive 9234.2-25, October 1993], which directs that when waivers of applicable or relevant and appropriate requirements (ARARS) are issued based on technical impracticability in groundwater remedies, EPA should demonstrate:

...that contamination sources [in the case of the Joint Site, the NAPL sources] have been identified and have been, or will be, removed and contained to the extent practicable [Section 4.3].

This ROD makes no determination or specification as to NAPL recovery or immobilization, or the feasibility of these actions at these sites, other than to determine that enough NAPL cannot be recovered with existing technologies to reduce contaminant concentrations to drinking water standards at all points in the contaminant distribution (this is further discussed in Section 10 of this ROD).

Both the remedial actions selected in this ROD, and any remedial actions for NAPL recovery or immobilization that may be selected by EPA in ROD amendments subsequently, may be necessary to fully address the principal groundwater-related threat. However, because it will be technically impracticable to recover enough NAPL to reduce groundwater concentrations to drinking water standards in the containment zone, the remedial actions selected in this ROD to isolate the NAPL will be necessary *regardless* of the degree of NAPL recovery or immobilization ultimately selected in the second phase. Because of this, and because the process of evaluating alternatives for NAPL recovery or immobilization is not yet completed, EPA is proceeding with

the selection of this remedial action in advance of the completion of the remedy selection process where NAPL recovery and/or immobilization will be addressed.

#### **4.6 Finalization of Del Amo Waste Pits ROD**

This ROD finalizes the provisions of the Del Amo Waste Pit remedy that EPA had designated as interim when it issued its ROD for that remedy in 1997. Specifications and details related to this are discussed in Sections 12 and 13 of this ROD.

**Table 4-1**  
**Affected Media at the Montrose Chemical and Del Amo Superfund Sites**  
 Record of Decision for Dual Site Groundwater Operable Unit  
 Montrose Chemical and Del Amo Superfund Sites

| <b>MONTROSE CHEMICAL<br/>SUPERFUND SITE</b>   | <b>DEL AMO<br/>SUPERFUND SITE</b>                                       |
|---|---|
| Groundwater   | Groundwater   |
| NAPL  | NAPL  |
| Surface soils on and<br>near the original plant property  | Surface Soils on the original plant property                            |
| Sediments in existing storm water pathways  | Indoor air in businesses  |
| Sediments and soils in neighborhoods<br>contaminated by DDT due to historical<br>surface water pathways and/or aerial<br>dispersion | Del Amo Waste Pits area (separate interim ROD<br>finalized by this ROD) |
| Sediments in the sanitary sewer system  |   |
| DDT-contaminated fill in a neighborhood   |   |
| DDT-contaminated sediments<br>on the Pacific Ocean floor  |   |

## **5. Major Documents**

The documents that EPA considered in selecting this remedy appear in EPA's administrative record for this remedy which contains more than 6000 documents and is available at the Torrance and Carson public libraries and at EPA's Region IX Offices in San Francisco. Various documents are also available at the State Department of Toxic Substances Control in Cypress. The following seven documents are required by the NCP and are of particular importance to the remedy selected by this ROD:

1. *Final Remedial Investigation Report for the Montrose Site; Los Angeles, California;* May 18, 1998; originally prepared by Montrose Chemical Corporation of California and Revised by U.S. Environmental Protection Agency, Region IX. 2 volumes.
2. *Final Groundwater Remedial Investigation Report; Del Amo Study Area;* May 15, 1998; prepared by Dames & Moore for the Shell Oil Company and The Dow Chemical Company. 3 volumes.
3. *Final Joint Groundwater Feasibility Study for the Montrose and Del Amo Sites; Los Angeles, California;* May 19, 1998; prepared by CH2M Hill for the U.S. Environmental Protection Agency, Region IX. 1 volume.
4. *Joint Groundwater Risk Assessment; Montrose and Del Amo Sites; Los Angeles County, California;* February 1998; prepared by McLaren Hart for the Montrose Chemical Corporation, and Dames & Moore for the Shell Oil Company and The Dow Chemical Company. 1 volume.
5. *Supplement to the Joint Groundwater Risk Assessment for the Montrose and Del Amo Sites; Los Angeles, California;* May 18, 1998; prepared by CH2M Hill for the U.S. Environmental Protection Agency, Region IX. 1 volume.
6. *Fact Sheet: Montrose and Del Amo Superfund Sites: EPA Proposes Groundwater Cleanup Plan; (General Fact Sheet Version);* June 1998 by the United States Environmental Protection Agency Region IX. 14 pages.
7. *Remedy Proposed Plan for Dual Site Groundwater Operable Unit, Montrose and Del Amo Superfund Sites; Technical and Expanded Version;* June 1998 by the United States Environmental Protection Agency Region IX. 47 pages plus graphics.

All of these documents appear in EPA's administrative record for this remedy.

## 6. Definition of the Term "Joint Site"

The National Contingency Plan (NCP), the regulation governing the Superfund Program, defines "on site" at 40 C.F.R. §300.5 as:

*"...the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action."*

The boundary of a Superfund site occurs at the limits of the areal extent to which contamination has come to be located. Knowledge of this boundary changes as remedial investigations reveal additional areal extent that is contaminated, or as the contamination spreads. It usually is not possible to know with complete certainty all places where contamination has come to be located, even at the conclusion of the remedial investigation, and so in turn the site boundary cannot be known with complete certainty. What is considered the boundary of a site is not static but changes as the knowledge about the extent of contamination changes.

This ROD does not make formal determinations as to the boundaries of the Montrose Chemical Superfund Site nor the Del Amo Superfund Site. Again in accordance with the above definition, each "site" is neither congruent with nor confined by the boundaries of any specific property with which the former Montrose Chemical plant or the former Del Amo plant were associated.

In the case of this remedy, several factors gave rise to the need for EPA to define a term to refer, in concept and by convention, to the area to which the remedy selected by this ROD is assumed to apply:

- As discussed, this ROD is addressing the contamination from the two sites as a single technical problem.
- For convenience and simplicity a shorthand term was needed to encompass the lengthy and awkward reference to groundwater at "the Montrose Chemical and Del Amo Superfund Sites."
- The Montrose and Del Amo Sites lie in an industrial area where other sources of groundwater contamination exist. Some of these other sources will be directly affected by this proposed remedial action, others will not. There needed to be a conceptual (as opposed to absolute) basis for determining how the remedial action selected by this ROD applies to some of these areas and not to others.

- This ROD defines several areas of contaminated groundwater within the Montrose Chemical and Del Amo Superfund sites, to which differing requirements shall apply (e.g. ARAR waivers, containment only, full cleanup, etc.). All such areas occur by definition within the union of the two Superfund sites, and a conceptual basis for this region was needed.

Because of these factors, this ROD does not refer to either site individually unless specifically mentioned. Rather, the ROD uses the term *Joint Site* to refer to the area within which the selected remedial action will apply. The area within the Joint Site is based on: 1) the extent of the contamination and 2) the nature and likely effects of the remedial actions selected by this ROD. The latter consideration is included because the remedial action may have a hydraulic influence on certain overlying and surrounding contamination sources that must be considered part of the Joint Site due to their proximity to the remedial action. These hydraulic influences on the sources have been identified with the assistance of the groundwater model (see Section 1.2.3, Section 2, and Appendix B of the Joint Groundwater Feasibility Study (JGWFS), EPA 1988). Specifically, the term "Joint Site" in this ROD refers to:

- The former Montrose Chemical and Del Amo plant properties;
- The areal extent of groundwater affected by the contamination originating or emanating from the former Montrose Chemical and Del Amo plant properties;
- Any areas of groundwater contamination originating or emanating from sources in the vicinity of the former Montrose and Del Amo plant properties that is wholly contained within the areas described in the preceding bullet items;
- Any areas of groundwater contamination that are partially overlapping, or distinct, but in proximity to the areas of groundwater described in the preceding bullet items *and* that likely would be significantly affected by the remedial action selected in this ROD.

There are sources of groundwater contamination farther afield surrounding the former Montrose and Del Amo plant properties that are not likely to be affected by this remedy. These sources are not considered to be part of the Joint Site. Most of these are subject to cleanup investigation and/or other cleanup actions directed or overseen by the State of California. While EPA has made no such determination at present, it is possible that in the future such sources would be shown to have an influence on the Joint Site that cannot be avoided. By definition, these sources would then be part of the Joint Site.



The use of the term Joint Site does not imply that a formal Joint Site boundary exists that can be depicted on a map. Rather, EPA intends to give conceptual guidelines as to the area being addressed by the remedial action.

It is further noted that *Joint Site* refers not only to the existing known extent of contamination as described by the above bullet items, but to the *actual* extent of contamination so-described, whether known or not known, both presently and in the future.